

Patent claims

1. Frequency converter, in particular for construction site devices operated with an electrical current having a higher frequency than line frequency, having

- a converter device for converting the electrical current frequency, and having
- a housing that surrounds the converter device,

the housing having:

- a converter receptacle (14) that surrounds a board chamber (28) for the converter device,
- a housing segment that is connected to the converter receptacle (14) and that acts as a cooling area (30), inside which there are situated cooling air ducts (40, 41, 56) and a fan (34) that is suitable for conveying cooling air through the cooling air ducts,
- in the cooling area (30), an external, first annular profile (16), and
- additional annular profiles (36, 48) that are oriented to one another in relation to the axis of the first annular profile (16) in such a way that the annular profiles (16, 36, 48) surround each other with a distance from one another, transverse to a main axial direction, so as to form at least two annular chambers (40, 56) that act as cooling air ducts;
- the annular profiles (36, 48) situated inside the first annular profile (16) ending with an axial spacing from the separating wall (31) of the converter receptacle (14) so as to form an air deflection area (41) that acts as a cooling air duct.

2. Frequency converter according to Claim 1, **characterized in that** the cooling area (30) has a transformer chamber (38), adjacent to the cooling air ducts (40, 41, 56), for accommodating an isolating transformer (60a, 60b, 60c) for producing an output voltage that differs from a line voltage.

3. Frequency converter according to Claim 1 or 2, **characterized in that** the converter receptacle (14) and the cooling area (30) are coupled with one another thermally by a separating wall (31).

4. Frequency converter according to one of Claims 1 to 3, **characterized in that** the fan (34) is situated inside the first annular profile (16), coaxial thereto, in such a way that it is suited to suction a cooling air stream via one of the annular chambers (40) and to guide this air stream past at least a part of the separating wall (31) in the air deflection area (41), and to expel the air stream via a different annular chamber (56) according to the counterflow principle.

5. Frequency converter according to Claim 4, **characterized in that** the fan (34) is situated in the air deflection area (41).

6. Frequency converter according to one of Claims 4 or 5, **characterized in that** adjacent to the first annular profile (16) there is situated a second annular profile (36) that surrounds an annular transformer chamber (38) that is limited inwardly by a third annular profile (48).

7. Frequency converter according to Claim 6, **characterized in that** in order to form a heat sink, the third annular profile (48) is made up of an outer ring (49) and an inner ring (54), cooling fins (50, 52) being situated in the area between the outer and inner ring that form a wall of one of the annular chambers (56) acting as cooling air ducts.

8. Frequency converter according to Claim 7, **characterized in that** a part (52) of the cooling fins connects the outer ring and the inner ring (49, 54) to one another, and between these cooling fins (52), fins (50) are situated on the outer ring (49) that freely protrude radially inward.

9. Frequency converter according to one of Claims 4 to 8, **characterized in that** the outer, first annular profile (16) engages with the adjacent annular profile (36) according to the tongue-

groove principle (42, 44).

10. Frequency converter according to one of Claims 6 to 9, **characterized in that** the transformer chamber (38) can be closed in the axial direction by annular covers (46, 47) that extend between the outer limitation, by the second annular profile (36), and the inner limitation, by the third annular profile (48), of the transformer chamber.

11. Frequency converter according to one of Claims 6 to 10, **characterized in that** the transformer chamber (38) contains a toroidal core transformer assembly (60a, 60b, 60c).

12. Frequency converter according to one of Claims 1 to 11, **characterized in that** the annular profiles are extruded profiles.

13. Frequency converter according to Claim 12, **characterized in that** the extruded profiles (16, 36, 48) are aluminum extruded profiles that have been cut to fit.

14. Frequency converter according to Claims 1 and 4, **characterized in that** the outer, first annular profile (16) is connected in centering fashion with the converter receptacle (14).

15. Frequency converter according to one of Claims 1 to 14, **characterized in that** the converter receptacle (14) is made up essentially of an aluminum cast part.

16. Frequency converter according to one of Claims 4 to 9 and Claim 10, **characterized in that** the third annular profile (48) is centered in relation to the second annular profile (36), which is adjacent to the first annular profile (16), by the cover (46, 47) that closes the transformer chamber (38).

17. Frequency converter according to Claim 4, **characterized in that** the fan (34) is situated such that it suctions cooling air via the annular chamber (40) adjacent to the first, outer annular profile (16), and conducts this air to the outside via the annular chamber (56) enclosed by the transformer chamber (38).

18. Frequency converter according to one of Claims 1 to 17, **characterized in that** the cooling area (30) is closed in the axial direction on the one hand by the separating wall (31) of the converter receptacle (14) and on the other hand by a cover (18) that is provided with air passage openings (21).

19. Frequency converter according to one of Claims 1 to 18, **characterized in that** the board chamber (28) is closed on the one hand by the separating wall (31) of the converter receptacle (14) and on the other hand by a front plate (22).

20. Frequency converter according to one of Claims 1 to 19, **characterized in that** a converter board (32) housed in the board chamber is encapsulated with a power module and is exchangeable.